

I apologize if you receive this twice -- I didn't word wrap the original so went back to do so. I don't know if your interface submits the filing immediately or only when I finish the second page. I will also submit a copy as a Microsoft Word file.

I'd prefer to use html -- you can find that version at <http://www.satn.org/about/separateconnectivity.htm>

## History

Like any other system, our understanding of telecommunications has evolved and changed. In engineering the phone system, there were a myriad of technical problems to be solved in order to be able to carry voice conversations over long distances or even around the world. The signal had to be delivered with precise timing with every component of the network adjusted just right. Because the equipment was so expensive there was great emphasis on precise planning for capacity.

Similarly, television was an amazing feat of engineering in the 1930's. It took very precise engineering to synchronize the video beam in the kinescope (the camera) with the image shown in the receiver. Many technical tricks were used including interlacing so that successive scans filled alternating lines to produce a smoother image. People then took advantage of the accidental properties, such as adding closed captioning by using the "vertical blanking interval" (the time it took to move the beam from the bottom back to the top of the screen).

The rise of the Internet in the 1990's (though the process actually started decades earlier) has demonstrated that we can now treat both telephony and television as streams of bits over a packet network. In the network itself all packets are treated the same with no special handling for audio or video streams. The network doesn't even have the notion of a circuit since successive packets needn't go to the same destination.

## Connectivity

The pragmatic definition: Connectivity is the unbiased transport of packets between two end points. This is also the essential definition of "IP" (Internet Protocol).

There is a strong boundary between the IP layer and the applications built upon it. TCP, for example, is an application protocol. In the term "TCP/IP" the slash emphasizes the separation of the two.

## The virtuous cycle

Since no application's packets get special treatment, the IP layer created a new commodity, connectivity, and set in motion the virtuous cycle of low prices generating new applications. These applications generated new demand. The new capacity created to meet this demand

drove down the unit price but generated higher aggregate revenue to the connectivity providers.

It is still difficult for many people to grasp the power of the virtuous cycle set in motion by an effective marketplace structure. In the 1970's the military paid millions of dollars for computers that were far less powerful than the machines we use for children's video games.

It also means that now telephony and television can be treated as streams of packets built upon the connectivity layer. There is a caveat in that we need sufficient capacity in our networks to carry this traffic. Early efforts to send audio and video over the Internet were limited by the capacity of the network but it is now becoming common and accepted to listen to live events over the Internet and, unlike radio, there is no predefined limit on the quality.

We now have home networks running at 100 megabits per second bought along with pencils at the local stationery store. And soon, a billion bits per second will be common. We already have Internet backbones that support a trillion bits per second per strand of fiber.

Applying this to telephony and television

What does this mean?

We can now treat telephony and television as applications built upon any available connectivity. We are already used to the idea that we access any Internet service from any provider.

We have seen a harbinger of this in the 1970's when the Federal Court mandated that telephone service be defined as the jack on the wall and not include the telephone itself (this was the Carterphone decision). Until then, we couldn't plug in our own answering machines or modems. The phone companies saw themselves as providing phone calls rather than connectivity.

This is merely a shift in point of view. But then, all that Copernicus did was shift the reference point for computing the orbit of planets from the Earth to the Sun which simplified calculations even though it was initially less accurate than Ptolemy's epicycles.

If we go back to first principles, we would treat connectivity as just another utility like water and electricity. Hauling bits would be no more mysterious than hauling garbage. In fact, some cities are already providing their own connectivity by laying municipal fiber. (Canada is leading the United States at this point.)

With connectivity as just another utility we would expect to have all television content available at any time just like we expect to have the web available. Instead of a dozen broadcast slots (which we call channels) we could view not just any of the myriad of television productions available, we would just as easily view our children's soccer even if we are traveling on another continent and would be free to choose our viewing surface, be it a large low-resolution "TV" or a small very high-resolution reading surface. And, as we've learned with the lack of interest in video phones, we also appreciate the option of talking without the burden of also looking good (and attentive).

If this sounds familiar, it is because it is the stuff of science fiction. But it is also reality and is already happening. It is remarkable that there is no longer anything remarkable about the "kindergarten-cam" which allows parents to watch their kids from the office.

The problem with assuming today's framework

If we turn from the exciting reality of the Internet back to the other reality of Telecommunications we experience culture shock.

But for those who live within the complex world of telecom regulation day in and day out, the idea of going back to first principles isn't shocking, it's simply inconceivable. It represents a degree of reengineering that is dismissed as naïve and politically unrealistic. Once you accept the premises of the regulatory framework, all of its intricacies seem reasonable and necessary.

Yet, even many within these heavily regulated industries acknowledge that we will eventually have gigabits of connectivity everywhere and thus the revenue for voice telephony is already dropping to zero. By maintaining two very different kinds of businesses within a single corporation the shareholders are denied the ability to maximize the value of the shares by making an informed choice. Instead the profits are used for cross-subsidies and, as we have seen, for the operators own naive investments in dotComs.

We feel the pain in the tale of John Henry as he has to come to terms with the technologies that leave him behind. In a different example, ulcers had their own mystique associated with the moral judgment associated with stress. This made it difficult to accept the fact that they were just another easily treatable bacterial infection.

The solution

But it is simple.

Once we see that connectivity is the basic resource and that telephony and television are simply applications built on connectivity we can

seize the opportunity to replace complex regulation with the power of the marketplace. We can heed the examples of the IBM Consent decree that allows for the hardware/software industry. We also have a precedent in the remedy wherein the FCC required that television networks divest themselves of their studios.

We need to start by recognizing that there must be a distinct connectivity business in order to avoid the inherent conflict between the commodity business of providing connectivity and the business of delivering services and content. Even with the best of intentions the incumbent application providers are advantaged by benign neglect. The only remedy is a strong separation.

This means we must require that existing companies separate their "wire" operations from their content/service businesses. The hard part is making the transition from a business model that assumes the compelling advantage of owning the "wires". The lack of effective alternative paths allows the providers to charge for bit streams according to their value and not their cost because neither competitors nor customers have effective alternatives. To the extent that regulators fashioned competitors, they were created in the image of the existing players and thus CLECs (the competitors) were all too often miniature replicas of the ILECs (incumbents).

#### Marketplaces

The test of whether an industry is propelled by Moore's law is whether, when I ask for more, I get more. In the current broadcast model, for example, a cable TV provider uses a gigabit pipe to send the same programs to all homes. Getting a second interface (set-top box) in my home doesn't increase choice or capacity. If that same wire were treated as 10 megabits per interface (assuming 100 homes per segment), then buying a second interface would double the capacity to that home. The ability to buy more capacity at commodity prices represents a dramatic change.

We need to remember that there is a big difference between being pro-business and being pro-marketplace. Capitalism is all about marketplaces. Capitalism fails if we try to preserve a given business model. In telecommunications if we simply preserve a business then we have failed.

By recognizing the need to separate connectivity from applications we have the opportunity to unleash the power of the marketplace that has served so very well in computing and in the Internet.

- Bob Frankston, 2002-01-29